

What is claimed is:

1. A gas turbine engine comprising:
  - 5 (a) a rotating combustion system; and
  - (b) a rotating turbine system, wherein the rotating combustion system is operatively connected to the rotating turbine system thereby forming a single rotating assembly, which rotates about a common axis.
2. The gas turbine engine as claimed in claim 1, wherein the rotating turbine system  
10 further comprises a rotating nozzle and a downstream stationary diffuser or counter-rotating turbine stage.
3. The gas turbine engine as claimed in claim 1, further comprising an upstream compressor.
4. The gas turbine engine as claimed in claim 1, further comprising a combustion  
15 manifold, a turbine nozzle and a series of turbine blades operatively extending from the combustion manifold to the turbine nozzle.
5. The gas turbine engine as claimed in claim 1, further comprising a combustion manifold, a turbine nozzle and a series of turbine blades operatively extending from a point between the combustion manifold and the turbine nozzle to the turbine nozzle.
- 20 6. The gas turbine engine as claimed in claim 1, wherein the combustor and turbine operate in a radially outflow configuration.
7. The gas turbine engine as claimed in claim 6, further comprising an axial outflow nozzle.
8. The gas turbine engine as claimed in claim 1, wherein the compressor further  
25 comprises an inducer to provide for a pressure rise.
9. The gas turbine engine as claimed in claim 1, further comprising a secondary impeller for isolating a premixed fuel mixture from a series of heated upstream walls.

10. The gas turbine engine as claimed in claim 1, wherein a fuel is directly injected into a combustion chamber in such a manner as to produce a temperature gradient that isolates a series of turbine blades from a hot combustion gas.
- 5 11. The gas turbine engine as claimed in claim 1, further comprising a cooling system designed to cool the components of the gas turbine engine.
12. The gas turbine engine as claimed in claim 11, wherein the cooling system further comprises a closed loop through which a liquid flows.
- 10 13. The gas turbine engine as claimed in claim 11, wherein the cooling system uses a cooling fluid that undergoes a liquid-vapor phase change, thereby cooling the walls of the combustor.
14. The gas turbine engine as claimed in claim 1, further comprising an ignition system for igniting a fuel/air mixture.
15. The gas turbine engine as claimed in claim 14, wherein the ignition system comprises a catalytic igniter, a resistive heater, a spark ignition, a pilot flame and or a pre-heater.
16. The gas turbine engine as claimed in claim 1, wherein the single rotating component operates as a core to a multi-stage gas turbine.
17. The gas turbine engine as claimed in claim 15 further comprising at least one additional axial or radial compressor stage upstream of the single rotating component.
- 20 18. The gas turbine engine as claimed in claim 15 further comprising at least one additional axial or radial turbine stage downstream of the single rotating component.
19. The gas turbine engine as claimed in claim 1 further comprising a counter-rotating turbine operatively connected to said turbine.
20. The gas turbine engine as claimed in claim 1 further comprising a rotating nozzle.
- 25 21. The gas turbine engine as claimed in claim 20, wherein the rotating nozzle utilizes a convergent-divergent geometry.

22. A gas turbine engine comprising:

- (a) a compressor;
- (b) a turbine, operatively connected with the compressor into a single impeller having a plurality of rotating passages; and
- (c) a combustion system, wherein the combustion system is integrated into the rotating passages of the compressor/turbine single impeller.

23. The gas turbine engine as claimed in claim 22, wherein the compressor, combustor and or turbine are separately removable.

10 24. A gas turbine engine comprising:

- (a) a rotating combustion system;
- (b) a radial impeller operatively coupled to the rotating combustion system; and
- (c) a rotating turbine nozzle having a series of turbine nozzle blades, wherein the rotating combustion system remains geometrically fixed in relation to the radial impeller and turbine nozzle blades, all of which spin at a similar rate of rotation about a common axis of rotation.

15 25. The gas turbine engine as claimed in claim 24, further comprising a stationary diffuser or counter-rotating downstream turbine stage.

20 26. The gas turbine engine as claimed in claim 25, wherein a flow enters the rotating combustion system from the radial impeller, exits the rotating combustion system into the rotating turbine nozzle while in a common rotating reference frame and then exits the common rotating reference frame and is diffused in the stationary diffuser or counter-rotating downstream turbine stage.